THE CONVECTIVE WATCHER

From the Director's Desk…

Welcome to the Storm Prediction Center newsletter. This edition finds us on the threshold of the annual peak in United States severe thunderstorms and tornadoes, and rapidly approaching the summertime fire weather season. We have a great group of professionals, focused on working with our partners to support emergency decision making and public safety. We are deeply committed to our role in helping to keep the public safe from extreme weather events, and I hope the articles in this newsletter help you better understand our current efforts and continuing passion toward this goal.

—Dr. Russell Schneider, SPC Director

More Than Just Forecasts

by Roger Edwards, SPC Lead forecaster

Every SPC forecast has roots in science. We use digital and print archives of hundreds of research papers covering topics from tornadoes to lightning to winter storms, fire weather, satellite and radar tools, computer models, data analysis, societal impacts, ways to verify forecasts, and much more. Unusual storm scenarios are some of the greatest mysteries in all of earth science, especially with the most dangerous, deadly and surprising events historically. For that reason, SPC takes the science of hazardous weather seriously. We don't just read research, we do research—a lot of it.

"Every SPC forecast has roots in science. SPC is a world leader in forecasting-related science."

For decades, SPC has been a world leader in forecasting-related science. Our forecasters and support staff continue a tradition of research dating back to the 1950s, when our predecessor (the National Severe Storms Forecast Center)

landed in Kansas City, Missouri. SPC collaborates with researchers elsewhere in the National Weather Center and worldwide. That includes the pioneering Hazardous Weather Testbed located next to our forecast area. The HWT brings together public and private-sector forecasters, academics, lab researchers, students and trainers from around the globe. SPC scientists also have served as reviewers, editors, managers, and even co-founders for scientific journals, and in high positions in professional societies.

New SPC forecaster candidates must show strong scientific skills to be hired. Next, as part of months of training, they read numerous papers before demonstrating that understanding on the forecast desk. Senior SPC scientists (including forecasters) guide newer ones on project ideas and how to build important studies. Newer ones teach older ones innovative ways to analyze and examine data. Science builds on science, and we learn more and more about our atmosphere's wild side. This cycle passes on through generations, and it shows in ever-improving forecast results since the early Kansas City era. Some of today's youngest SPC scientists may be the mid-century senior mentors for forecasters who haven't been born yet.

You can access SPC research in our Publications website, which currently holds over 70 peer-reviewed journal articles and nearly 200 papers presented at scientific conferences. Check back—more papers are added every year.

SPC Forecaster Completes Ph.D. from the University of Oklahoma School of Meteorology

Dr. Ariel Cohen, a Mesoscale Assistant/Fire Weather Forecasters at the Storm Prediction Center, recently earned his Doctor of Philosophy in Meteorology from the University of Oklahoma School of Meteorology during Autumn Semester 2015. He successfully defended his dissertation entitled "Southeast U.S. Cold Season Severe Thunderstorm Environments and Their Depictions Using Multiple Planetary Boundary Layer Parameterization Schemes" in December 2015.

Coming from both academic and operational backgrounds in meteorology, Ariel sought to perform Ph.D. research that has strong roots in both of these arenas. His work was inspired by his time working at the National Weather Service Forecast Office in Jackson MS, as well as at the Storm Prediction Center. Severe weather forecasters are faced with the challenge of wintertime severe-weather forecasting, when warm and humid air originating from the Gulf of Mexico is sometimes drawn northward into the southeast U.S. in association with strong weather systems that are accompanied by strong winds throughout the atmosphere. This particular type of weather set-up can support limited, but sufficient, instability for thunderstorms, while strong vertical wind shear enhances thunderstorm updrafts and can sometimes create an environment favorable for tornadoes. With the Southeast featuring a relatively greater population density than some other parts of the country, and with many of the tornadoes in this regime occurring at night and during a time of year when many people may not be expecting severe weather, the type of weather regime that Dr. Cohen studied can provide substantial impacts to the public.

A primary focus of his research involved characterizing conditions specifically associated with tornadoes occurring in the Southeast during the wintertime. He also considered the morphology of the parent storms supporting the tornadoes, along with daytime versus nighttime variability in the environmental conditions associated with these tornadoes. As is typically the case with research,

new research builds upon the foundation set by previous research, and Ariel's research was no different in this regard, as it built upon the foundation of previous research, including that performed by multiple forecasters at the Storm Prediction Center.

A substantial contribution of his research was developing an understanding of the ways in which numerical weather models, which meteorologists use in the forecast process, represent the effects of turbulent processes occurring in the lowest portion of the atmosphere (the planetary boundary layer). It is important that forecasters accurately assess the environmental conditions supporting tornadoes for a forecast to be correct, and this is especially challenging in the southeast U.S. wintertime severe-weather regime when instability can be very limited. Given the sensitivity of this environment to forecasts of instability, accurate model forecasts of instability-related variables are of utmost importance and can be strongly influenced by the representation of lower-atmospheric turbulence. As such, Dr. Cohen investigated and tested multiple formulations of model representation of lower-atmospheric turbulence, and even developed and tested new ones based on a previous formulation. He found a small subset of these formulations, including ones that he developed, to offer the most accurate depictions of the southeast U.S. wintertime severe-weather environment. His findings are intended to improve numerical modeling of these weather regimes to assist in anticipating their potential to produce hazards.

Dr. Ariel Cohen and his doctoral committee. Pictured from left to right: Dr. Ariel Cohen, Dr. Steven Cavallo, Dr. Kevin Kloesel, Dr. Scott Greene, Dr. Harold Brooks, and Dr. Frederick Carr.

Ultimately, Ariel is very proud to have completed this work owing to its importance from both operational and academic aspects in meteorology. After having worked in the NWS for several years, including positions at the NWS offices in Great Falls MT and Jackson MS and the National Hurricane Center in Miami FL prior to working at the SPC, he was able to combine his experiences in forecasting with his academic interests to cultivate a project intended to advance science – the purpose of the Ph.D. degree. Having been a Ph.D. student while concurrently being an SPC forecaster for four and a half years, he is looking forward to having a little more available time in the future now that he has finished his Ph.D., but he is committed to continue performing operationally focused research. Ariel is tremendously grateful for all of the support from his colleagues and friends at the SPC and across the NWS, his colleagues at the University of Oklahoma, and a fantastic and inspirational doctoral committee.

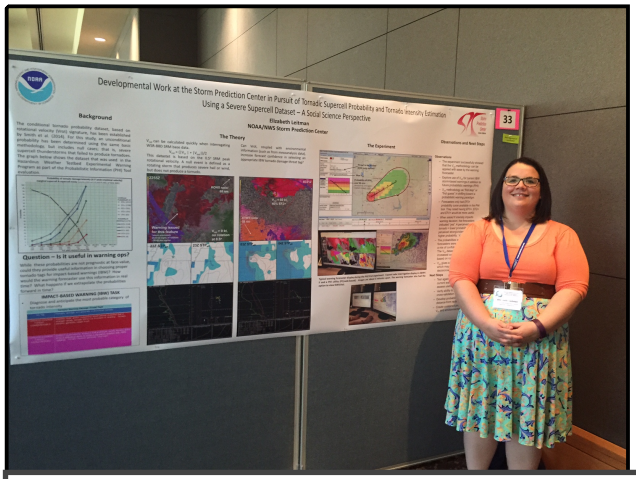
Did you know…

The SPC has it's roots in the late 1940s and early 1950s. The first successful tornado forecast was made on March 25, 1948 by Major Earnest J. Fawbush and Captain Robert C. Miller at Tinker Air Force Base near Oklahoma City. By 1951, Fawbush and Miller had established a severe storms forecast center at Tinker Air Force Base. This forecast center issued severe storm forecasts for all Air Force facilities in the lower 48 states. The first successful severe weather watch was issued on March 21, 1952, and by 1953, the Severe Local Storms (SELS) Unit was formed and operated 24 hours a day. The SELS Unit moved to Kansas City in 1954, and in 1995 was renamed the Storm Prediction Center. The SPC once again relocated, this time to Norman in 1997, where it has remained since.

National Weather Association and American Meteorological Society Annual Meetings

By Liz Leitman, Mesoscale Assistant/Fire Weather Forecaster

Attending professional conferences is an important part of bringing new ideas and methods into forecast operations. Each year, two professional meteorological societies, the National Weather Association and the American Meteorological Society, hold annual meetings where meteorologists present on a wide range of topics from new technology and research advances, case studies and findings for various weather events and



Left: Liz Leitman, SPC Mesoscale Assistant/Fire Weather Forecaster presents a poster at the 2015 National Weather Association annual meeting. Liz tested a new technique for determining the probability of tornado intensity based on radar data and how this method may be used by National Weather Service forecasters during warning operations.

Right: Russ Schneider, SPC director, gives a presentation at the 2015 National Weather Association annual meeting. Russ talked about products and services available from SPC, and future plans for forecast operations at the center.

Upper left: Patrick Marsh, SPC Techniques Development/Science Support Branch meteorologist, delivers a presentation on the Evolution of Storm Prediction Center Communication in the Social Media Era at the 2016 American Meteorological Society's annual meeting.

Upper right: Ariel Cohen, SPC Mesoscale Assistant/Fire Weather forecaster, gives a talk about the SPC fire weather program at the 2016 American Meteorological Society's annual meeting student conference.

Lower left: Lead forecaster, Steve Corfidi, and Mesoscale Assistant/Fire Weather forecaster, Ariel Cohen, pose for a picture with research student, Matthew Campbell, whom they mentored during the summer of 2015.

Lower right: Operations Branch Chief, Bill Bunting, and Lead forecaster, Steve Corfidi, judge posters at the student conference of the 2016 American Meteorological Society's annual meeting.

an array of other topics to increase knowledge and further the state of meteorological science. This is also an important time to build relationships and new partnerships between government operations, the private sector and academics. This year, several SPC forecasters and staff attended these meetings to share new and ongoing research, reach out to meteorology students, and to discuss new ideas and solutions to ongoing challenges. Below are various images captured during these two meetings.

A Fond Farewell…

By Jared Guyer, SPC Mesoscale/Outlook Forecaster

Corey Mead (right), former SPC lead forecaster, is pictured with Patrick Marsh (back left) and Ariel Cohen (front left) during one of his final shifts.

The SPC has recently said goodbye to two talented members of its family who leave us for other positions. The SPC will greatly miss Corey Mead and Greg Carbin for their friendship, leadership, adept forecasting abilities, and programming talents.

Lead Forecaster Corey Mead transferred to a similar position at the NWS office in Omaha/Valley, Nebraska. Corey had been a forecaster at the SPC since 2003 and he and his wife and children return to his prior office in order to be closer to their family. Corey was promoted to Lead Forecaster at the SPC in 2009. Corey issued nearly 800 watches during his tenure as a SPC Lead Forecaster. In just the past couple of years, a few of his operational forecasting highlights include issuing timely Particularly Dangerous Situation (PDS) Tornado Watches for the June 16, 2014 Pilger, Nebraska twin tornadoes and the November 17, 2013 Midwest tornado outbreak. Aside from dozens of operationally oriented research publications, Corey was instrumental in redesigning and modernizing the front page of the SPC website and implementing the popular Mesoanalysis page. In 2010 and 2013, he was awarded prestigious Isaac Cline Awards in recognition of these website-related accomplishments. Regarding his time at the SPC, Corey shared, "I want to thank my friends and colleagues at the Storm Prediction Center for an incredible 13-year experience. It was an honor and a dream come true to work for such a world-class organization."

The SPC has also bid farewell to Warning Coordination Meteorologist (WCM) Greg Carbin. Greg accepted a promotion to Forecast Operations Branch Chief at the Weather Prediction Center (WPC) in College Park, Maryland. Greg has worked in a variety of operational forecast capacities for the past 20 years at the SPC. He became the second-ever WCM at the SPC in 2007. Greg has appeared in major national and international media and has been interviewed extensively on topics from atmospheric science to the historical context of recent tornado outbreaks. As WCM, he was responsible for maintaining the national tornado database. Greg's coding and scripting skills are evident across the SPC website and include the upper air maps page, the composite and fire weather map pages, the SREF

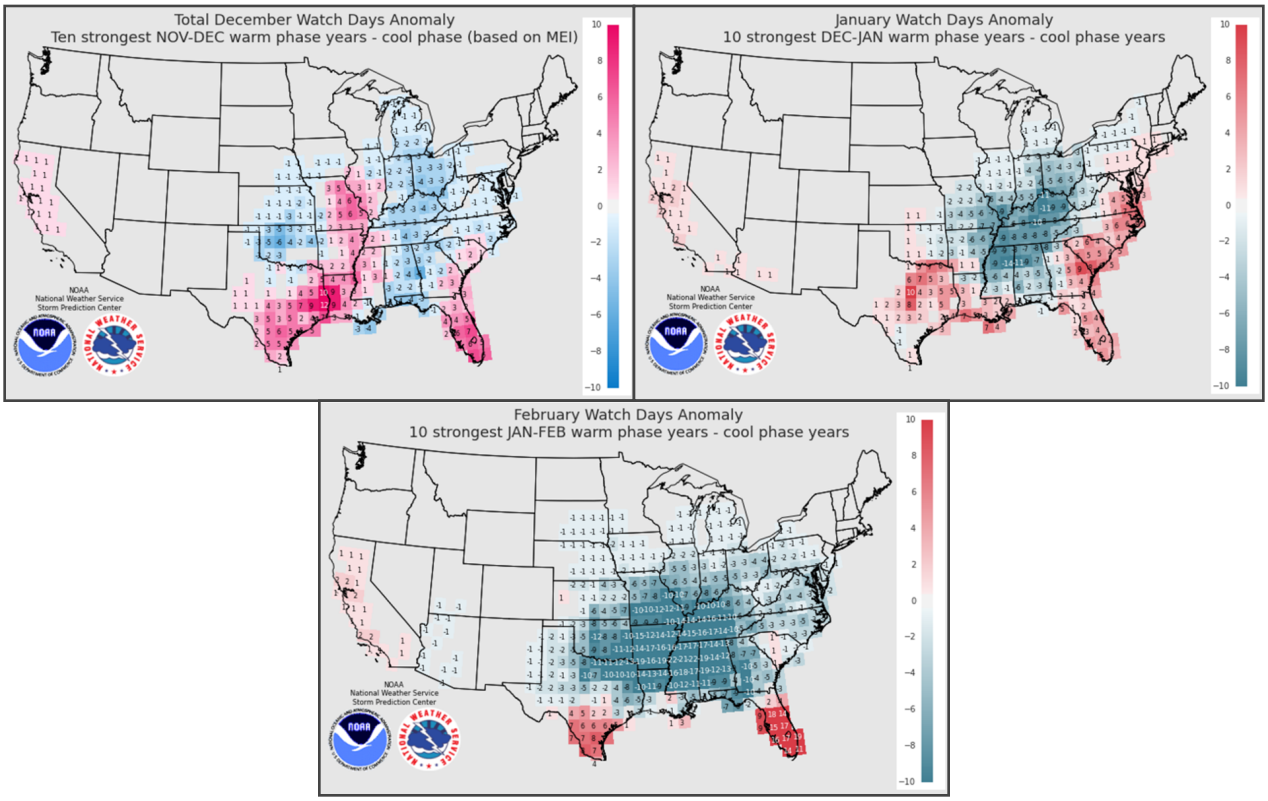
Greg Carbin, former SPC Warning Coordination Meteorologist, is pictured at the lead forecaster desk where he filled in for a final operational shift.

plumes, and the WCM page. Of his experience and tenure at SPC, Greg stated, “On countless occasions, I have thought of the SPC staff, and others I have worked with in Norman at NSSL, OU, and elsewhere, as the finest people I have ever had the pleasure of working with. I will miss the shared passion for severe weather meteorology and the camaraderie that exists here. I will cherish these relationships, and the amazing times we’ve shared, as long as I live.”

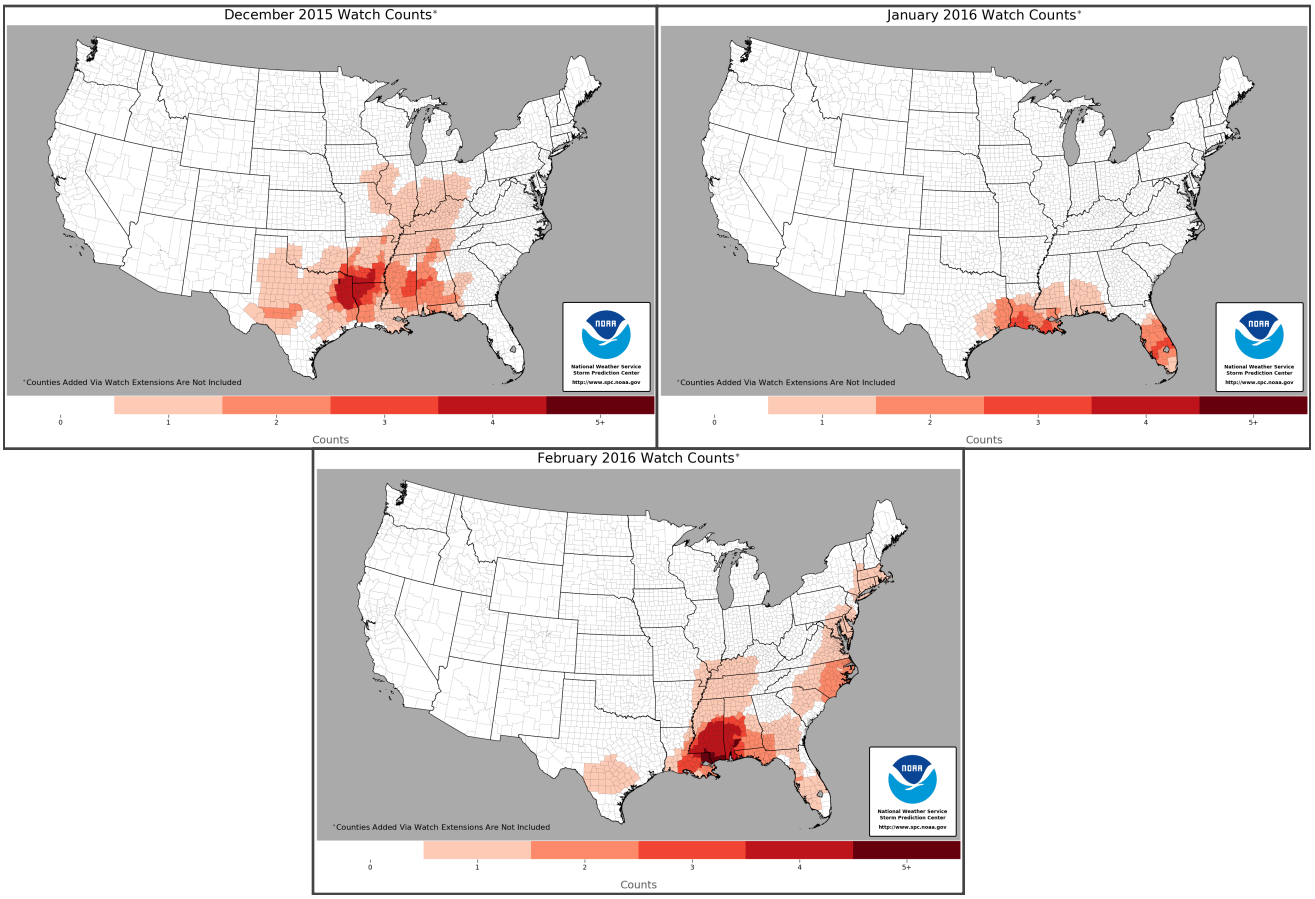
Cold Season Severe Weather and El Niño

By Liz Leitman, SPC Mesoscale Assistant/Fire Weather Forecaster; graphics by Patrick Marsh, SPC Techniques Development/Science Support Branch Meteorologist and Greg Carbin, WPC Operations Branch Chief

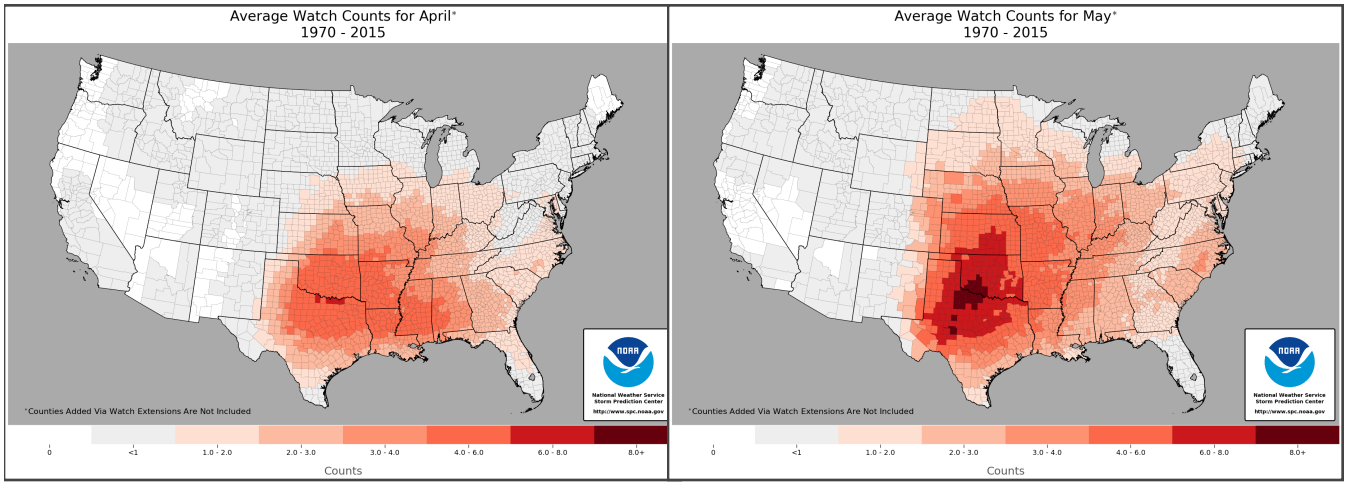
The winter of 2015-2016 saw a very strong El Niño persist across the equatorial Pacific Ocean. We know that El Niño can influence large-scale weather patterns, and as a result, may impact how active or inactive severe weather is during any given month or season. How did this past winter shape up compared to other strong El Niño years? Let’s take a look…



In the maps above, the red shading indicates areas where watch issuance is favored during a strong El Niño event. This would imply that, during strong El Niño years, the severe threat over the middle to lower Mississippi Valley and much of southern and eastern Texas as well as across Florida into the mid-Atlantic becomes focused more toward south Texas and the Florida peninsula as we move later into the winter. How does this compare with actual watches issued by SPC during the 2015-2016 winter?



While there are some similarities between the 2015-2016 wintertime watches issued and the anomaly maps above, there are also some notable differences, specifically the bulls-eye over the northern Gulf Coast in February. While the ENSO phase can give us clues about which general regions may experience above or below normal severe weather activity, it cannot predict exact events, and there are often will be deviations from typically favored areas, as these maps illustrate. El Niño is expected to persist but weaken through the summer months of 2016. Curious about average watch counts during the spring? See the maps below, which show the average number of watches issued by the SPC during April and May, regardless of ENSO phase.



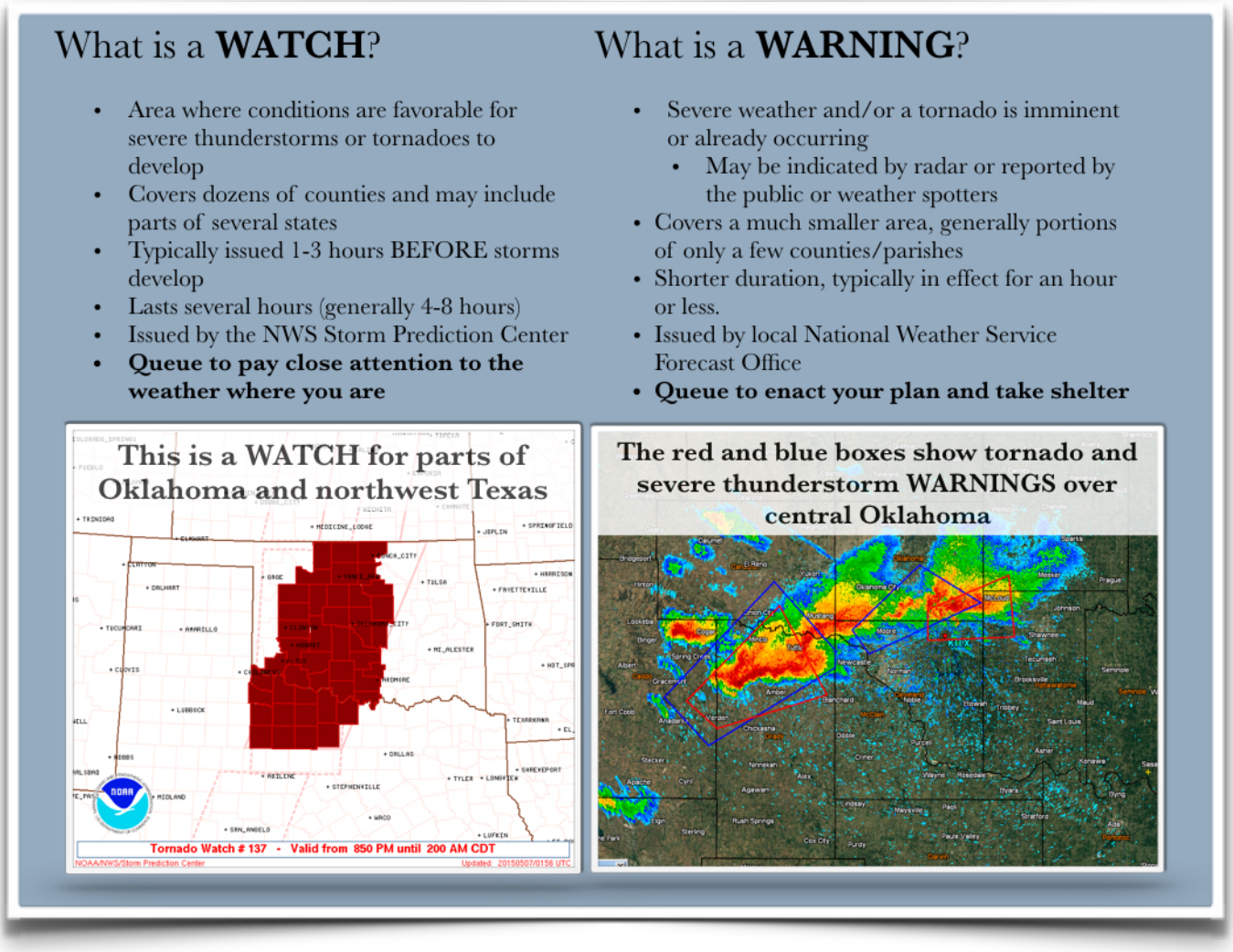
Spring is here! Are you prepared?

By Liz Leitman, SPC Mesoscale Assistant/Fire Weather Forecaster

The season of severe thunderstorms, tornadoes and wildfires is upon us. Here are some tips to help keep you prepared wherever you are, no matter the threat.

1. Know Your Threat

- Check your local forecast daily to stay aware of any potential threats that day
- Have multiple ways of receiving hazardous weather information
  - Cell phone, computer, local television, radio, weather radio, phone tree, etc.



LINK: Watch the SPC video “What is a Watch?” here.

2. Have a Plan

- If severe weather is a concern, think about where you will be when the threat is expected
  - Know where shelters, adequate interior rooms, basements and emergency exits are located
- If threatening weather is expected, consider cancelling or rescheduling outdoor events or have a plan for close, quick sheltering options
- Discuss various plans with friends and family *before* the threat is imminent
- Have a kit ready ahead of time
  - Store a flashlight, batteries, water and snacks, first aid kit, any necessary medications

3. Take Action!

- An warning has been issued for your area; it's time to implement your plan and head to shelter!

Ready

Prepare. Plan. Stay Informed.

These steps are helpful in any emergency, not just weather-related emergencies. To learn more, visit the ready.gov severe weather page where you'll find a wide range of information from education materials to preparedness tips and methods.

As always, stay up to date on the latest information at www.weather.gov, www.spc.noaa.gov or find us on Facebook and Twitter!